Materials Science and Engineering Department

Winter Seminar Series

Fluids in Confinement - Their Role on Emerging Technologies for Energy and the Environment

Prof. Kelsey Hatzell
Department of Mechanical and Aerospace Engineering a
the Andlinger Center for Energy and the Environment
Princeton University

February 5, 2025
11AM-12PM | Hill Seminar Room (LeBow 240)

Water plays a critical role in range of chemical, physiochemical, geological, and energy applications. Understanding water at the *molecular scale* is critical for unraveling processes and mechanisms related to separations, energy storage, and remediation challenges. This talk discusses benchtop and synchrotron techniques to examine CO_2 adsorption and desorption in a novel family of moisture-driven CO_2 sorbents. Traditional thermal swing sorption technologies for **direct air capture** require a large amount of energy during the regeneration process (>179 kJ/mol). An alternative approach to thermal- and pressure-swing sorbents is moisture-driven sorbents. These sorbent materials bind CO_2 from the air when the surrounding is dry, and desorbs CO_2 when hydrated. This mechanism has been observed in some materials (ion exchange resin, inorganic material, etc.) but is not completely understood. The talk will broadly discuss how **water** in **confinement** can be utilized to tailor CO_2 capture and regeneration and advanced separations for water desalination and mineral recovery applications.

Dr.Kelsey Hatzell is an assistant professor at Princeton university in the department of Mechanical and Aerospace Engineering and the Andlinger Center for Energy and the Environment, At Princeton University, Dr. Hatzell leads the Materials for Energy and Climate Lab (HatzellLab.Princeton.edu). The group primarily works on energy storage, energy conversion, and separations applications and is particularly interested at using non-equilibrium x-ray techniques to probe materials during *in situ* and *operando* operating conditions. .Dr. Hatzell earned her Ph.D. in Material Science and Engineering at Drexel University, a M.S. in Mechanical Engineering from Pennsylvania State University, and a B.S./B.A. in Engineering and Economics from Swarthmore College. Hatzell is the recipient of several awards including the ORAU Powe Junior Faculty Award (2017), NSF CAREER Award (2019), ECS Toyota Young Investigator Award (2019), finalist for the BASF/Volkswagen Science in Electrochemistry Award (2019), the Nelson "Buck" Robinson award from MRS (2019), Sloan Fellowship in Chemistry (2020), and POLiS Award of Excellence for Female Researchers (2021), NASA Early Career Award (2022), the ONR Young investigator award (2023), and Alfred Rheinstein Award (2023).

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